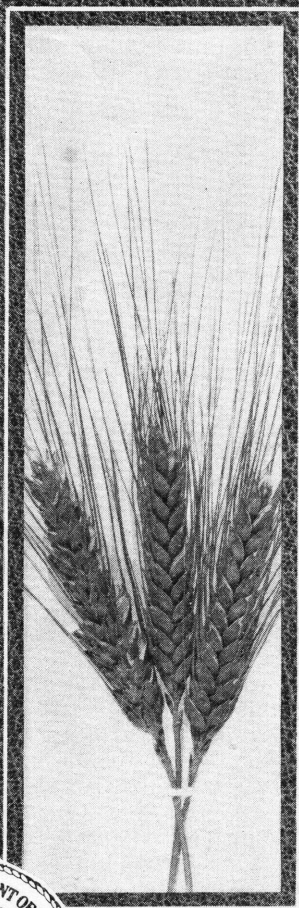


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# U. S. DEPARTMENT OF AGRICULTURE

FARMERS' BULLETIN No. 1706



## VARIETIES *of* DURUM WHEAT



**T**HE DURUM WHEATS are spring varieties with thick, compact heads, long, stiff beards, and large, hard kernels. They are grown almost wholly in the northern Great Plains area, where they are best adapted because of their resistance to rust and drought, which enables them to out-yield other spring wheats. The durumms are produced chiefly in North Dakota, South Dakota, and Montana. About 5,000,000 acres are grown annually in the United States.

Durum wheat is used largely for making semolina, from which macaroni, spaghetti, and similar products are manufactured. Domestic manufacturers use less than half the annual production. The price of durum wheat often is less than that of similar grades of hard red spring wheat.

Ten varieties of durum wheat are grown commercially in the United States. These differ in their adaptation and yielding ability, resistance to rust and drought, and in the quality of their grain, as well as in their appearance.

Kubanka is the variety best adapted to all the varying conditions in the sections in which durum wheats are produced. It is high yielding, somewhat resistant to rust, of good milling quality, and well suited to making both macaroni and bread.

Mindum is the most productive durum variety in Minnesota and northeastern North Dakota and is somewhat resistant to stem rust. Macaroni made from Mindum has the best color.

Acme and Monad are two similar amber durum varieties that are very resistant to stem rust. Acme is the highest-yielding durum variety in most of South Dakota, and Monad is the best-yielding variety in North Dakota. Macaroni made from these varieties is grayish and is considered by manufacturers to be less salable than that made from Kubanka.

Nodak is a productive and rust-resistant variety in North Dakota and South Dakota, but is not equal to Kubanka for macaroni manufacture.

Pentad is a red-kerneled variety and is the most resistant to stem rust. For this reason it is extensively grown from late seeding. As the macaroni made from Pentad is very gray, the variety is not used by manufacturers. The grain is chiefly exported or mixed with other cereals for feed.

Peliss is the best-yielding durum variety in the higher and drier sections of Montana and Wyoming, where rust does not occur. It is not equal to Kubanka for macaroni manufacture.

This bulletin is a revision of and supersedes Farmers' Bulletin 1304, The Durum Wheats.

# VARIETIES OF DURUM WHEAT<sup>1</sup>

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## DESCRIPTION

THE DURUM WHEATS are spring varieties with long stiff beards, and most of them have short, thick, compact heads. The heads are flattened across the sides rather than along the faces of the meshes, as in common wheat. Most of the varieties have white (amber) kernels. The grain is used chiefly for the manufacture of a granular flour known as semolina, from which macaroni, spaghetti, and other alimentary pastes are made.

The durum varieties have very hard kernels. Because of their distinctive characters they are classed as a separate division or species (*Triticum durum*) from the common bread wheats (*T. sativum*). Under the official grain standards of the United States they are graded as class II durum wheat. An average of nearly 5,000,000 acres, or about 8 percent of the wheat acreage of the United States, is devoted annually to the production of this class of wheat. Ten varieties are grown commercially.

## WHERE GROWN

The durum wheats are grown almost wholly in the northern Great Plains area. They are produced principally in North Dakota, South Dakota, and Montana. A small acreage also is grown in Nebraska, Colorado, Minnesota, and Wyoming. The section where most durum wheats are produced lies just west of the Red River Valley in North

<sup>1</sup>The information given in this bulletin is based upon (1) varietal experiments conducted by the Division of Cereal Crops and Diseases of the Bureau of Plant Industry, U.S. Department of Agriculture, and State agricultural experiment stations; (2) classification studies of all American wheat varieties; (3) a survey of the wheat varieties of the United States, in cooperation with the Bureau of Agricultural Economics; and (4) personal observation by the writer of the wheat fields in the States where these varieties are grown.

Dakota and comprises an area from 100 to 250 miles wide, extending from the northeastern part of South Dakota into Canada. The distribution of durum wheat in the United States in 1929 is shown in

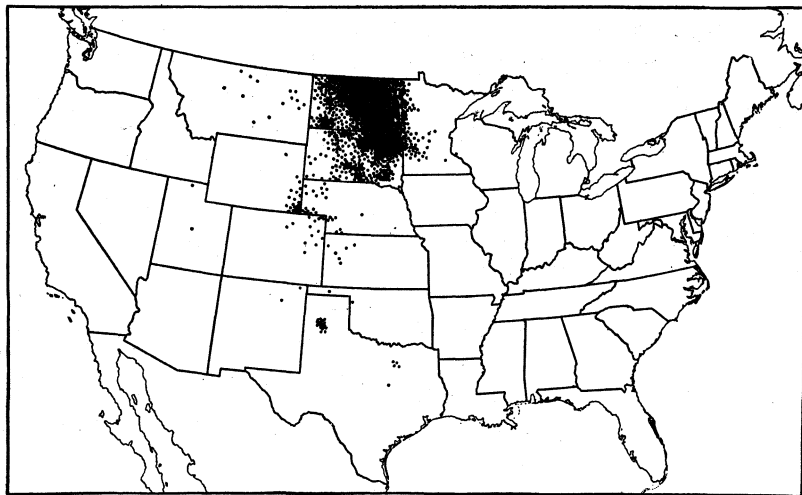


FIGURE 1.—Distribution of durum wheat in 1929. Each dot represents 2,000 acres. Estimated area, 5,842,000 acres.

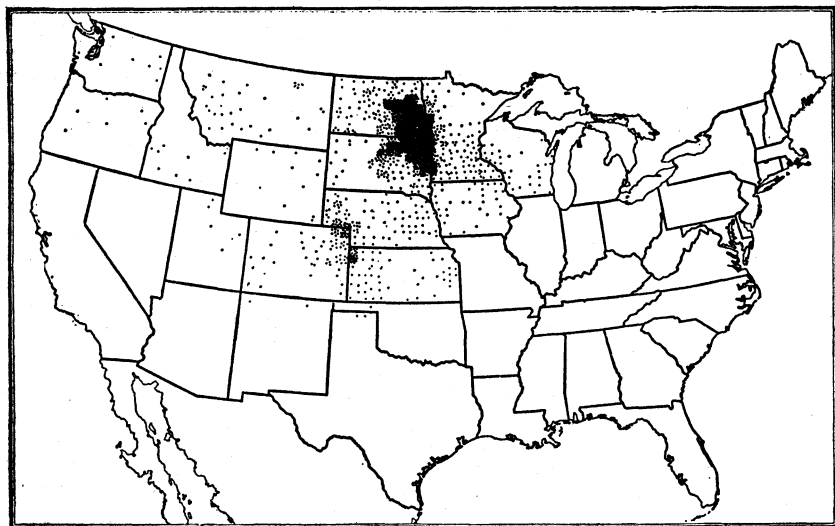


FIGURE 2.—Distribution of durum wheat in 1909. Each dot represents 1,000 acres. Estimated area, 2,503,000 acres.

figure 1. This distribution is very different from that in 1909, which is shown in figure 2. It will be noted that during the last 20 years the center of durum-wheat acreage has moved northward and westward.

## AREAS TO WHICH ADAPTED

The durum wheats are fairly well adapted to the region between the Rocky Mountains and the Mississippi River where spring wheats are grown. In general, this region includes the Great Plains area and the upper Mississippi Valley. From northern Iowa and Nebraska southward winter wheats are grown more successfully than spring wheats. The durum wheats therefore are not well adapted to this area or to the humid areas of the entire eastern United States. In the Pacific Coast States and in the intermountain districts of the West other classes of wheat consistently outyield the durum varieties. However, in the northern spring-wheat region durum wheats generally outyield the hard red spring wheats. In the subhumid sections of this region, including Minnesota, northeastern South Dakota, and the Red River Valley of North Dakota, durum wheats often develop soft, starchy kernels and therefore are not of satisfactory quality, although they usually outyield the spring common wheats. Were it not for the resistance of durum wheats to stem rust they should not be grown in the subhumid sections.

In the dry, northeastern part of the Great Plains area durum varieties are best adapted and have consistently produced higher yields than have the spring common wheats. Under the semiarid conditions of this section durum wheats usually develop hard, bright, vitreous, amber-colored kernels well suited to the manufacture of semolina and macaroni. Because they are resistant to stem rust and drought and also produce good yields under favorable conditions, the growing of durum wheats in the northern Great Plains steadily increased until 1928. Since that time the production of durum wheat has been restricted because of the increasing acreage of Ceres, a higher yielding hard red spring wheat, and also because of the decreasing export market demands.

## USES

Until recent years there usually has been an active foreign demand for durum wheat, but in the early days of its production the development of a domestic market did not keep pace with production. Flour mills were not satisfactorily equipped for grinding durum wheats. Some mills did begin grinding them, however, and gradually large mills have been constructed for grinding durum wheats exclusively. A large trade in semolina and durum flour was developed and a large macaroni industry has finally been established. The annual domestic consumption of durum wheat is now about 32,000,000 bushels, of which an average of 14,000,000 to 15,000,000 bushels have been milled into semolina. Durum wheat that is not exported or used by the macaroni industry is utilized for feed or is blended with other classes of wheat or flour. In the United States very little, if any, flour made from durum wheat alone is used for bread making.

## MARKET PRICE

The export demand for durum wheat has usually controlled the market price. When this demand has slackened the price has dropped

considerably. Before 1912 the price was always lower than that of hard red spring wheat. About half the time from 1912 to 1919 the price of durum wheat at primary markets was as high as that of similar grades of hard red spring wheat and the price of durum wheat has occasionally been the higher. During the World War, when the price of wheat was fixed, the price of equal grades of durum and hard red spring wheat was the same. Since then the price of durum usually has been somewhat lower than that of hard red spring wheat, depending on the quantity produced.

Because of the greater resistance of durum wheats to rust and drought, which occur frequently in the northern spring-wheat region, they usually have a higher test weight and grade higher in their class than do hard red spring wheats grown under the same conditions.

Low prices for durum wheat tend to decrease its acreage and production. In former years the increased acre yields of durum wheat over those of hard red spring in the northern spring-wheat region have offset a lower price amounting to several cents a bushel. The risk of partial or total loss from rust is still much less with durum than with most common wheats. One of the most important phases of durum-wheat production is the growing of suitable varieties. The durum varieties grown commercially are discussed in this bulletin.

#### VARIETIES

Ten varieties of durum wheat are grown commercially in the United States. Most of these are distinct and can be identified by plant or kernel characters. Many additional varieties have been grown experimentally, but have not been distributed to farmers and therefore are not discussed in this bulletin.

Varieties of durum wheat differ widely in their adaptation and yielding ability, their resistance to rust and drought, and the quality of their grain, as well as in their external structure and appearance. A few varieties that are similar in appearance differ in origin and adaptation. For convenience in discussion, the varieties are divided into five groups on the basis of chaff, beard, and kernel characters.

*Group 1.*—Chaff smooth, yellow; beards yellow; kernels white (amber), mid-sized to large: Kubanka, Mindum, Arnautka, Acme, Monad, Nodak.

*Group 2.*—Chaff smooth, white; beards white; kernels red, mid-sized: Pentad (D-5).

*Group 3.*—Chaff smooth, white; beards black; kernels white (amber), very large: Peliss.

*Group 4.*—Chaff velvety, black; beards black; kernels white (amber), large: Kahla.

*Group 5.*—Chaff velvety, black; beards black; kernels red, large: Barnatka.

**GROUP 1.—CHAFF SMOOTH, YELLOW; BEARDS YELLOW; KERNELS WHITE (AMBER), MIDSIZED TO LARGE**

The varieties included in group 1, although somewhat similar in appearance, show quite different adaptations. Most of the durum varieties grown in the United States are in group 1, the most important being Kubanka.

#### KUBANKA

Kubanka has smooth yellowish chaff, yellowish beards, and large white (amber) kernels (fig. 3, A). The heads are thick and compact



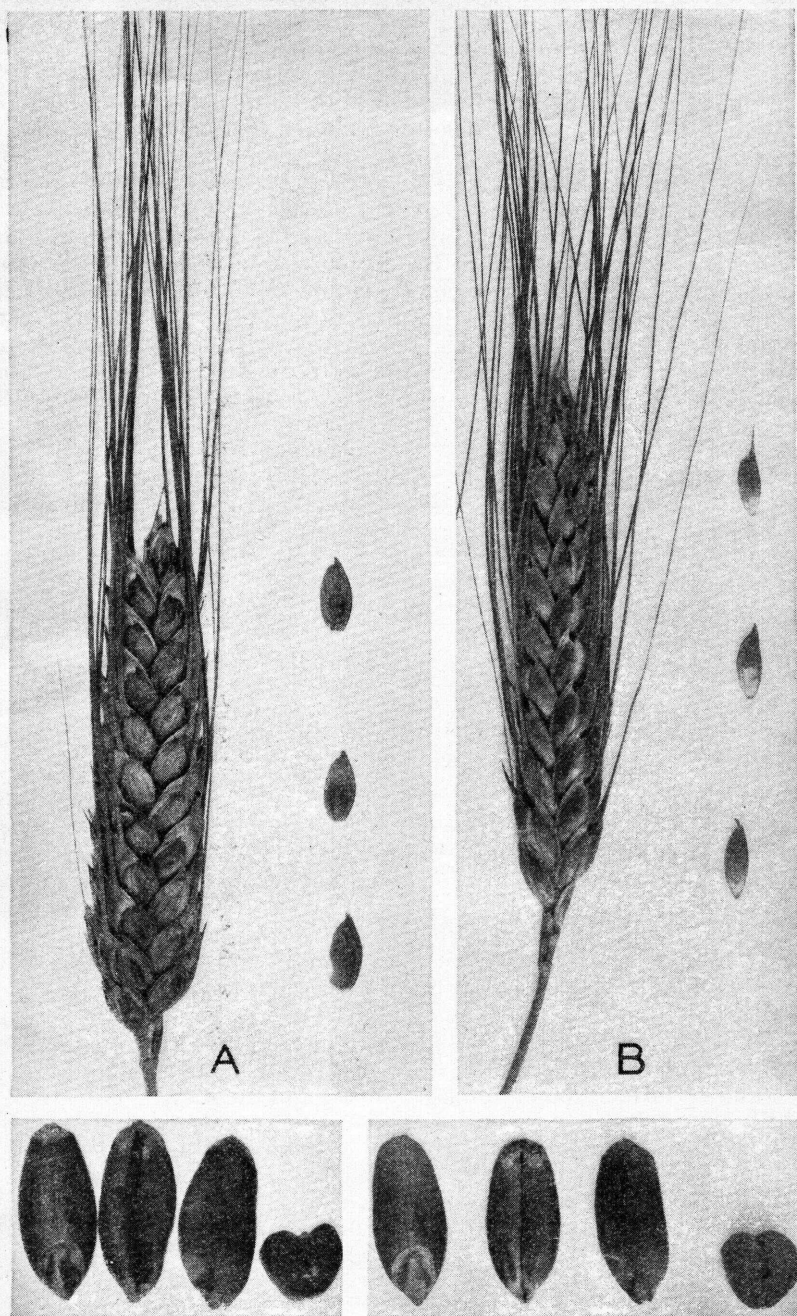


FIGURE 3.—Heads, chaff, and kernels of (A) Kubanka and (B) Mindum. Heads and chaff, natural size; kernels, three times natural size.



and nod slightly at maturity. This variety has shown fair resistance to stem rust under field conditions. Several pure-line strains of Kubanka, very resistant to stem rust, have recently been selected.

Kubanka was introduced into the United States from Russia by the Department of Agriculture, several different lots having been obtained. The principal introduction (F.P.I. no. 5639; C.I. no. 1440) was made in 1900 by M. A. Carleton, cerealist of the Department, from the Uralsk Government in Russia. The seed was increased and distributed by the Department of Agriculture and the North Dakota and South Dakota Agricultural Experiment Stations. Several lots of durum wheat identical with Kubanka were introduced under other names, but they have not become commercially established. They were known as Beloturka, Gharnovka, Pererodka, Taganrog, and Yellow Gharnovka. Kubanka, as originally introduced, was not pure. This has made improvement by pure-line selection possible. A small percentage of red kernels was found in the original shipment and red kernels still persist in the variety.

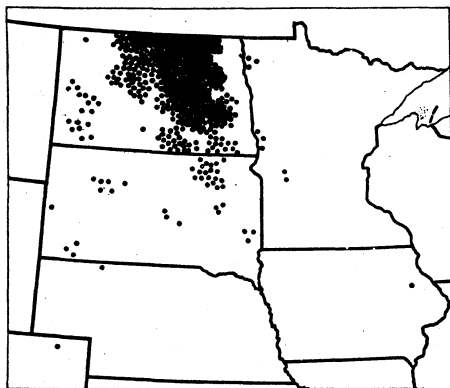


FIGURE 4.—Distribution of Kubanka wheat in 1929. Each dot represents 1,000 acres. Estimated area, 725,000 acres.

Kubanka is grown chiefly in North Dakota, South Dakota, and in several other States (fig. 4). A considerable portion of the durum-wheat acreage consists of unidentified varieties including Kubanka. Just what proportion of this is Kubanka is not known, but it probably is sufficient to make this the leading variety in total acreage.

Kubanka is more widely adapted than any other variety. In experiments in the northern Great Plains it has for years produced consistently high yields.

In the higher and drier western sections of the Great Plains area, including eastern Montana, Wyoming, and Colorado, it has been outyielded by the Peliss variety.

In the subhumid section east of the Great Plains area Mindum has produced higher average yields than Kubanka. Where stem rust is an important factor Kubanka has been outyielded by the more rust-resistant varieties, Acme, Monad, Nodak, and Pentad.

Although usually resistant to stem rust under field conditions, Kubanka is sometimes badly injured by rust. It is more resistant to rust, however, than Mindum, Arnautka, Peliss, and Kahla. For the manufacture of semolina and macaroni Kubanka equals or excels other durum varieties grown in the United States, with the exception of Mindum.

#### MINDUM

Mindum resembles Kubanka in general appearance. It differs, however, in being taller and in having a much shorter brush (tuft of hairs) on the tip of the kernels. The beards of Mindum (fig. 3,

B) are slightly longer than those of Kubanka, and Mindum differs slightly in a few other characters. Being a pure-line selection, Mindum as grown commercially is freer from mixtures than is Kubanka.

Mindum was first found as a mixture in a field of common wheat at the Minnesota Agricultural Experiment Station in 1896. After selection and testing it was distributed to Minnesota farmers in 1917. Mindum is now grown in Minnesota, chiefly in the Red River Valley, and in North Dakota. More than 300,000 acres were grown in 1929 (fig. 5). The largest acreage is in northern North Dakota, and its production is rapidly increasing in Manitoba, Canada.

Mindum has outyielded all other spring-wheat varieties in Minnesota. Although not extremely rust resistant, it is able to produce high yields in spite of the rust. Mindum should replace other durum varieties now grown in Minnesota. For the manufacture of macaroni it is preferred to all other durum varieties because of the excellent quality of the product.

#### ARNAUTKA

Arnautka, known also as Goose, Nicaragua, Pierson, and Wild Goose, formerly was one of the most widely grown durum varieties. The known acreage in 1929, however, was less than 18,000 acres. Arnautka differs from Kubanka in being taller and in having longer, more slender, and more nodding heads. The kernels are slightly longer and more slender than those of Kubanka, and the chaff has longer and sharper "beaks" (short beards on the outer chaff). Arnautka is more susceptible to stem rust than Kubanka. It also contains a greater mixture of other types of durum wheat, including red kernels, than does Kubanka.

Arnautka was first imported into the United States by the Department of Agriculture in 1864. However, most of this variety now grown probably was originally brought in by early Russian immigrants. It was grown by them in North Dakota, where it was called Wild Goose. Some of this Arnautka was obtained from T. N. Oium, of Lisbon, N.Dak., distributed by the Department of Agriculture in 1900, and tested with other durum varieties. Since the early nineties Arnautka has been grown in Texas under the name of Nicaragua. It is grown in South Dakota under the name of Pierson.

While Arnautka has been the most widely grown durum wheat in recent years, it is being rapidly replaced by Kubanka, Mindum, and more rust-resistant varieties. However, much of the wheat grown simply as durum or macaroni is Arnautka.

Arnautka formerly appeared to be best adapted to the subhumid and humid sections of the northern spring-wheat region, but during the past few years it has been severely attacked by stem rust in these sections. As a result, it recently has been outyielded by Kubanka in

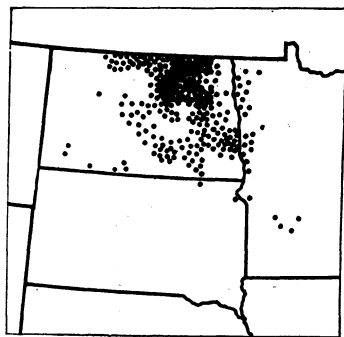


FIGURE 5.—Distribution of Mindum wheat in 1929. Each dot represents 1,000 acres. Estimated area, 322,000 acres.

the more humid sections, as well as in the semiarid portion of the northern Great Plains area, where it always has yielded less than Kubanka. The production of this variety, therefore, could be discontinued with profit to the grower.

Arnautka is fully equal to Kubanka in the manufacture of semolina and macaroni.

#### ACME

Acme has shorter stems, heads, and kernels than Kubanka and is much more resistant to stem rust. The heads also are smaller and not so thick as those of Kubanka.

The kernels are only midsized, pointed at the germ end, and blunt at the brush end, and somewhat boat-shaped. The straw is comparatively weak, so that it lodges easily under humid conditions. The variety is highly resistant to stem rust and has seldom, if ever, been injured by that disease.

Acme was originated from a pure-line selection of Kubanka (C.I. no. 1516) made at the Highmore (S.Dak.) substation by Manley Champlin, formerly of the Department of Agriculture. The selection was made in 1909, and after its high-yielding ability had been determined, seed was distributed from the Highmore substation in 1916 by the South Dakota Agricultural Experiment Station. As the variety differed from Kubanka, it was given the name Acme. Although it was distributed in the spring of 1916, its rust resistance was not known until later that season, when rust appeared in destructive abundance. Its rust resistance and its high-yielding ability caused Acme to become popular.

It now is grown widely in South Dakota and to some extent in North Dakota, Wyoming, and other States. It has outyielded most other durum varieties in nearly all sections of South Dakota and Wyoming. It is best adapted to South Dakota, especially in the sections where rust occurs frequently. More than 70,000 acres of Acme were grown in 1929.

Acme is inferior to Kubanka and Mindum for the manufacture of macaroni and is not desired by the trade because the macaroni made from it is often dull gray instead of bright amber. Therefore, the demand for Acme is limited and its price is lower than that of other amber durum varieties.

#### MONAD

Monad or D-1 (Durum No. 1) is similar in appearance to Acme. The size, shape, and color of the heads and kernels of the two varieties are almost identical. The varieties are equally resistant to stem rust. Monad also has a comparatively weak straw, but does not lodge so easily as Acme. The two varieties differ slightly in the quality of the grain.

Monad was obtained from the Saratov Government, Russia, in 1903, by H. L. Bolley, of the North Dakota Agricultural College. Several other introductions of wheat were made at the same time, all of which were grown at the North Dakota station from 1904 to 1910. During that period the introductions were selected for disease resistance. Seed of four durum varieties was distributed to farmers and to the Dickinson and Langdon substations by Professor Bolley in 1911. One of these varieties was designated as D-1 (Durum No. 1).

The identity of D-1 on the farms was almost lost. In 1917, after its value had become apparent at the Dickinson substation, D-1 was named Monad. During the rust epidemics of 1915 and 1916 the extreme resistance of this variety was strikingly apparent. Because of this and its high yield, seed of Monad was increased and again distributed by the North Dakota station.

In experiments in North Dakota, Monad generally has outyielded other durum varieties. It has been outyielded in Minnesota by Mindum and in South Dakota by Acme. In general, however, Monad is well adapted in the sections of these States where stem rust has been destructive. Like Acme, Monad is inferior to Kubanka for the manufacture of macaroni, as the product has a dull grayish color, but is a little better than Acme for this use. Because of the color of the macaroni, a lower price is paid for Monad than for any other amber durum variety except Acme.

#### NODAK

Nodak is very similar to Kubanka but is much more resistant to stem rust. The kernels of Nodak are softer and under humid conditions do not retain the hard, vitreous, amber appearance so well as do the kernels of Kubanka or Mindum.

Nodak was developed in cooperative experiments by the Division of Cereal Crops and Diseases, Bureau of Plant Industry, United States Department of Agriculture, and the North Dakota Agricultural Experiment Station at Dickinson, N.Dak. It is the result of a selection made from Kubanka in 1915. Nodak was first distributed for commercial growing in North Dakota in 1923. About 37,000 acres were reported in 1929.

Nodak outyields both Kubanka and Mindum in eastern North Dakota and in South Dakota, where rust usually occurs. Except in sections where rust is most severe, Nodak should not be grown in preference to Kubanka or Mindum, because it often will not grade so well and is less desirable for the manufacture of semolina and macaroni.

#### GROUP 2.—CHAFF SMOOTH, WHITE; BEARDS WHITE; KERNELS RED, MIDSIZED

Group 2 includes only one variety, namely, Pentad, or D-5, which differs from the other durum wheats in having white instead of yellowish chaff and red instead of white (amber) kernels. Several durum varieties, such as Kubanka and Arnautka, contain slight mixtures of red kernels. Many of these mixtures have been separated and grown and appear to have resulted from field crosses between durum and hard red spring wheats.

#### PENTAD

Pentad, or D-5 (Durum No. 5), is known also as "D-Fife", Ladd Durum, Red Durum, Resistant Fife, and Rustproof. The heads are more slender and less compact than those of the other durum varieties grown in this country (fig. 6, A). The kernels are short, boat-shaped, pointed at the germ end, blunt at the tip end, and dull red.



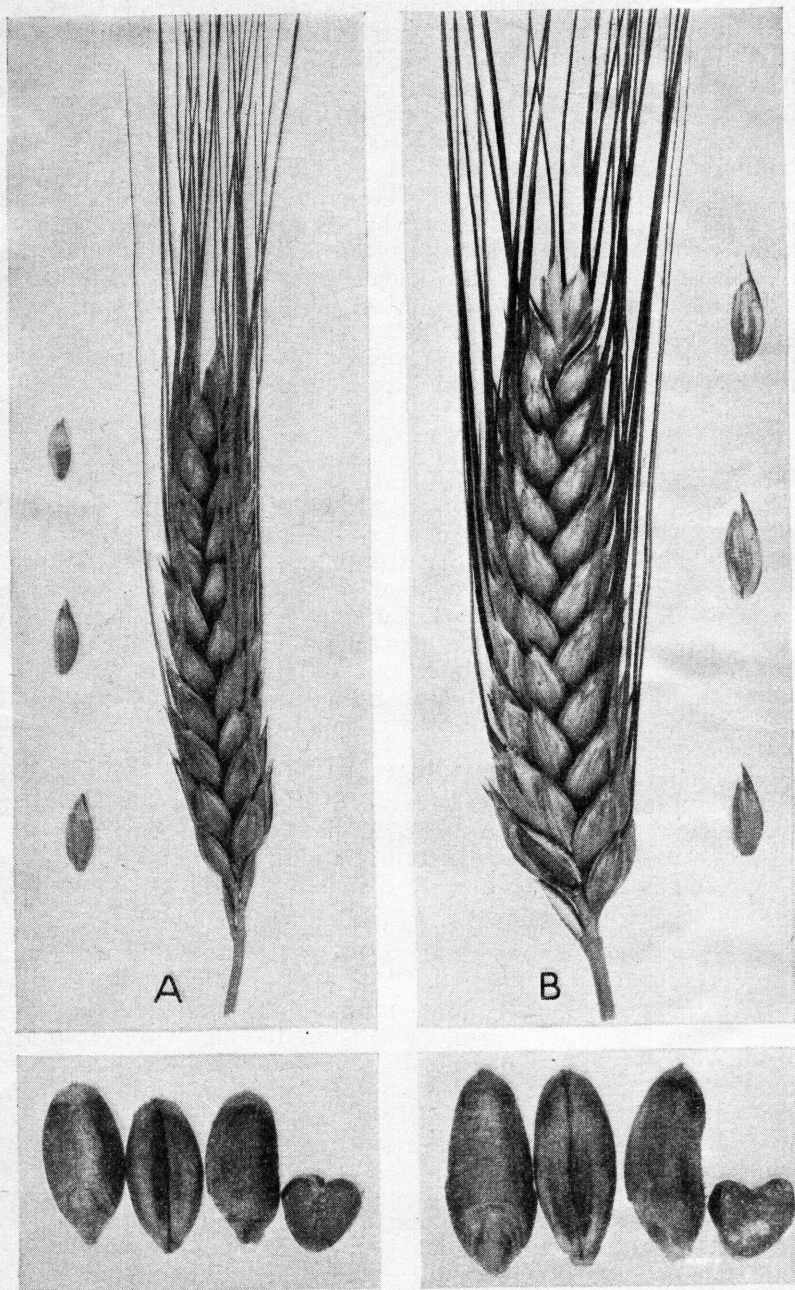


FIGURE 6.—Heads, chaff, and kernels of (A) Pentad and (B) Peliss. Heads and chaff, natural size; kernels, three times natural size.

The plants are of medium height and do not lodge so easily as those of Acme and Monad. Pentad is more resistant to stem rust than any other durum variety.



Pentad was introduced from Russia in 1903 by H. L. Bolley and was first distributed from the North Dakota Agricultural Experiment Station in 1911. It has become rather widely grown, especially in North Dakota, because of its extreme rust resistance. It is also grown in Minnesota, South Dakota, Nebraska, Wyoming, and Colorado. More than 1,000,000 acres of Pentad were reported in 1929. In spite of the relatively low price paid for the grain, the acreage of this variety has increased. When severe epidemics of stem rust occur Pentad frequently outyields all other varieties except, perhaps, Acme and Monad. The two latter are almost as productive as Pentad in seasons when stem rust is very abundant. Pentad, therefore, is best adapted to sections where stem rust is common. Because it is not injured by rust, it produces good yields from late seeding and is usually so grown. However, in these sections, other varieties grown from early seeding, such as Mindum in Minnesota and Kubanka in North Dakota, usually yield more than Pentad from late seeding. The grain of Pentad is not suitable for the manufacture of good quality semolina and macaroni, being less valuable for this purpose than that of Monad or Acme. Most of the grain of this variety is used for feed, particularly poultry feed.

**GROUP 3.—CHAFF SMOOTH, WHITE; BEARDS BLACK; KERNELS WHITE (AMBER), VERY LARGE**

The only variety in group 3 is Peliss. Another variety, similar to it, and known as Golden Ball, is grown to a very small extent in Canada, but it will not be discussed in this bulletin.

**PELISS**

Peliss (Pelissier) probably is more commonly known on farms as Black Bearded durum. It is a tall and vigorous variety. The heads are large, thick, and compact (fig. 6, B). The beards are long, stiff, and black, and the chaff is nearly white and similar to that of Pentad. When threshed, it can be distinguished from other durum wheats by the very long, thick, distinctly curved, white (amber) kernels. It is not resistant to stem rust.

Peliss was introduced into this country in 1900 by the United States Department of Agriculture. The original seed was obtained from M. Pelissier in the Province of Oran, Algeria. After thorough testing it was increased and distributed in this country, principally in Montana, by the Department of Agriculture and the Montana Agricultural Experiment Station.

This variety was grown in Montana, North Dakota, and South Dakota in 1929 on about 6,000 acres. It is most important in Montana, where it has outyielded other varieties of durum wheat. It is a high-yielding variety in eastern Colorado and Wyoming. In parts of these sections, however, winter wheat is more profitable than spring wheat. In the Dakotas and Minnesota, where stem rust is prevalent, the altitude lower, and the rainfall greater, it generally is outyielded by other durum varieties. It therefore is not well adapted east of Montana and Wyoming.

Peliss is slightly inferior to Kubanka in the manufacture of semolina and macaroni. The large size of its kernels causes some trouble in the cleaning machinery now used.

**GROUP 4.—CHAFF VELVETY, BLACK; BEARDS BLACK; KERNELS WHITE (AMBER), LARGE**

The only variety discussed in group 4 is Kahla. Very similar wheats are grown under several different names, but all are so nearly identical that they are considered as one variety.

**KAHLA**

Kahla, known also as Black Don, Black durum, Blackchaff durum, Black Emmett, Black Swamp, Purple durum, Red Swamp, and Sloat, has velvety or hairy black chaff, black beards, and white (amber) kernels. The short fine hairs occur mostly on the edges of the chaff. The heads are rather slender and nodding. The variety is not resistant to rust.

Kahla was introduced into the United States from Algeria by the Department of Agriculture in 1901. A similar wheat, containing mixtures of red kernels, was received from Russia under the name Black Don in 1900. Other introductions of this same type have been made by the Department and probably by certain individuals. Kahla occasionally is found as a mixture in other durum varieties. Both Kahla and Black Don were distributed for trial when first introduced by the Department but did not prove to be high-yielding varieties. Kahla has been grown commercially in Montana, North Dakota, and South Dakota, and to some extent in other States. It is relatively unimportant except in a few local sections. It was grown on about 28,000 acres in 1929.

The yields of this variety have been decidedly lower than those of Kubanka and several other durum wheats, both in the Great Plains and in subhumid sections. As Kahla is not resistant to rust, it should not be grown in sections where rust occurs. It does best in the western Great Plains area, as it is early and very resistant to drought, but it does not yield so well as other varieties of durum and the leading varieties of hard red spring wheat. In grain quality Kahla is equal or superior to Kubanka in the manufacture of semolina and macaroni.

**GROUP 5.—CHAFF VELVETY, BLACK; BEARDS BLACK; KERNELS RED, LARGE**

The only variety discussed in group 5 is Barnatka, which is of minor importance in the United States.

**BARNATKA**

Barnatka differs from Kahla mainly in having red kernels. It was introduced into this country from Russia and distributed for commercial growing by A. L. Hilleman, of Windsor, N.Dak., about 1925. The variety is not pure, and little is known regarding its yield, quality, or rust reaction. Nearly 5,000 acres were reported in 1929.

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<i>Agricultural Adjustment Administration</i> -----	{ GEORGE N. PEEK, <i>Administrator.</i>
	{ ———, <i>Co-administrator.</i>

